

Application No. 10/713,898
Response dated: December 27, 2007
Reply to Office Action dated: August 27, 2007

REMARKS

Claims 21 and 23-27 remain pending. In an Office Action mailed August 27, 2007, the Examiner acknowledged and entered applicants' prior amendment. The indication in the Office Action Summary that Claim 22 is withdrawn from consideration is believed to be in error.

The Examiner withdrew all prior claim rejections and objections but imposed non-final rejections in view of a change to applicants' priority claim and new grounds of rejection. The Examiner asserted that the prior-filed applications do not support the micro-channel limitations in the specification and are directed only to practice of the method of a planar surface. The Examiner provided interpretations of the terms "micro-channel" and "wall." The Examiner rejected Claims 21, 24, 25 and 27 under 35 U.S.C. §103(a) as being unpatentable over Kambara et al. (U.S. Patent No. 5,356,776) in view of Bensimon et al. (U.S. Patent No. 6,265,153) and further in view of Miyachi et al. The Examiner also rejected Claim 23 as unpatentable over Kambara et al. The Examiner rejected Claim 26 as being unpatentable over Kambara et al. in view of Bensimon et al. and Miyachi et al. in further view of Kaiser et al.

Applicants respond to each point raised by the Examiner and respectfully request reconsideration.

Priority

Applicants respectfully disagree with the Examiner's contention that the disclosures of the priority documents do not support the asserted priority claim. While the priority documents do refer to planar surfaces for optimal elongation and fixation of single nucleic acid molecules (see, e.g., Section 5.1.2 of U.S. Patent No. 5,720,928), the general description of a laminar flow elongation device in the application is not so limited and does not specify any requirement for a planar surface. The Examiner has not pointed to any limiting disclosure that requires such a surface. Rather, the priority documents teach a skilled person that elongation can be accomplished under conditions where laminar flow can be achieved. To the extent that laminar flow can be accomplished on a non-planar surface, such surfaces are also embraced by the priority disclosures.

The Examiner further asserts that the priority documents do not support "micro-channel limitations in the instant specification." Absent a more detailed explanation, applicants cannot adequately respond to this assertion, except to say that the priority

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documents refer throughout to micro-channels and that the nature and dimensions of micro-channels were well known to skilled artisans before applicants' filing date. Applicants prefer to reserve further comment on the micro-channel issue unless and until the Examiner clarifies the aspect of the disclosure that is alleged to be missing.

Claim Interpretation

Perhaps in connection with the proposed change to the priority claim, the Examiner offers an interpretation of the term "micro-channel" that includes channels of any size. This approach runs counter to the description present in the application, some of which is quoted by the Examiner, and conflicts with the longstanding understanding in the art of the term "micro-channel." Indeed the term is so well-known that the application requires no specific definition, as those in the art understand the term to mean channels having width dimensions on the order of microns as opposed to nanometers or millimeters. In the face of the acknowledged suggestion in the application of the micro-channel size, and the understanding in the art as of the filing date, applicants maintain that a reading extending the term "micro-channel" to all channels of any size is improper. Moreover, for reasons that will become apparent below, applicants maintain that the specific definition of micro-channel has no bearing on the rejections imposed under Section 103.

The Examiner also asserted that the term "wall" has no specific definition and is given the broadest reasonable interpretation, including a rounded particle or bead. Applicants maintain that the Examiner's definition is unreasonably broad, and that the term "wall," as applied to a micro-channel, has a well understood common meaning. For reasons that will become apparent below, applicants also maintain that the Examiner's definition has no bearing upon the rejection imposed under Section 103.

Rejections Under Section 103

Each of the Examiner's rejections relies upon U.S. Patent No. 5,356,776 to Kambara et al. Kambara discloses attaching a bead to one end of the DNA molecule, labeling a second end, and then introducing the modified DNA molecule into a channel until the bead blocks the channel aperture. With the bead end fixed at the end of the channel, the DNA molecule extends in a liquid (but not a laminar) flow. The Examiner's rejections are flawed and require a tortured reading of Kambara to arrive at the claimed invention.

Reading a "bead" as a "first wall" within the scope of the claims, the Examiner asserts that Kambara shows much of the invention. Kambara, whether taken alone or in combination

with other cited documents, cannot meet applicants' claims for at least two reasons. First, the claims do not recite "a wall and a micro-channel," but rather "a micro-channel having a first wall electrostatically attractive to the polymeric molecule." While the Examiner concedes that Kambara does not show an electrostatic attraction, the real problem is that the so-called "wall" is not a part of the micro-channel, but instead is outside of, and separate from, the micro-channel. Accordingly, the cited art does not teach what the Examiner says it teaches because Kambara does not disclose a channel having a wall, but rather two separate structures, one said to be a micro-channel, and the other said to be a wall, leads directly to the conclusion that. The logical inconsistency will be apparent -- if, in the Examiner's view, the polymeric molecule is attached to the wall, and IF the wall is part of the micro-channel, then the bead itself would need to be the micro-channel. The Examiner has not taken this position, because it cannot be supported.

Moreover, Kambara nowhere discloses that the liquid flow through the channel (to the extent that the "channel" of the rejections is relevant) is a laminar flow.

The Examiner rejected Claims 21, 24, 25 and 27 over Kambara et al. in view of Bensimon et al and Miyachi et al. The Examiner's recitation of Kambara teach regarding Claim 21 is flawed when it describes "(b) passing the polymeric molecules and carrier liquid through a micro-channel having a first wall attractive to the polymeric molecule to promote a laminar flow of carrier liquid in the micro-channel." (Emphasis added) As each of the rejections of Claims 21, 24, 25 and 27 depend upon this flawed reading, none can survive scrutiny of the cited art. Even if the Examiner's reading of the term "wall" is accepted, and even if Kambara meets the limitation of a wall attractive to the polymeric molecule, it does not meet the limitation quoted above, because the micro-channel does not have a first wall attractive to the polymeric molecule. Indeed, in the Kambara method, the so-called wall never forms a part of, or associates with, the micro-channel. Whether Kambara teaches optically inspecting the straightened polymeric molecule, it remains true that the so-called wall is not a wall of a micro-channel, but rather is a part separate from the micro-channel. The same holds for Claims 25 and 27.

Further, Bensimon is said to teach a process for aligning a micro molecule onto the surface of a support. Bensimon is invoked only because of the Examiner's overly broad reading of a micro-channel. As we have previously and successfully argued, Bensimon

shows not a micro-channel, but rather a pair of cover slips, and does not show laminar flow, but rather capillary force via meniscus movement.

Miyachi is included for its alleged teaching of removal or detachment of the first wall from the micro-channel. While the Examiner seeks to equate that removal with applicants' claims, the fact remains that the wall of the Examiner's rejection is not a wall of a micro-channel. Moreover, while Miyachi teaches removing paramagnetic particles from a mixture, such an approach would be irrelevant to applicants' method because paramagnetic removal of the particles or beads would also remove the attached polymeric molecules from the channel. If the Miyachi method were practiced, the structure produced in applicants' method that permits analysis would be destroyed.

As to Claim 25, the Examiner's reading is simply inaccurate and inconsistent with Claim 25. Claim 25 recites that step (b), which requires passing the polymeric molecules and carrier liquid through the micro-channel, causes (i) a straightening of the polymeric molecule in the laminar flow, (ii) attachment of one end of the polymeric molecule to the first wall, and (iii) attachment of the length of the polymeric molecule to the wall. The noted step in Kambara cannot cause one end of the polymeric molecule to attach to the first wall, because under the Examiner's approach, the molecule is already attached to the wall before it enters the channel. Likewise, only one end of the polymeric molecule is attached to the "wall." Any subsequent attachment of the length of the polymeric molecule would be to a structure other than the first wall, using the terms as defined by the Examiner.

Claim 23 is rejected over Kambara in view of the level of ordinary skill in the art. The claim recites introducing DNA into the micro-channel and then cleaving with a restriction enzyme. The Examiner asserts that it would be routine to change the order of steps shown in Kambara (cutting DNA with restriction enzymes and then introducing the cut DNA into the channel). However, changing the order of steps here would completely defeat the purpose of applicants' invention which employs intact, elongated molecules fixed in the channel before cleaving such that the natural order of fragments can be visualized. The Examiner will appreciate that cleavage prior to elongation and fixation would yield a jumbled collection of molecules whose natural order in the source molecule could never be determined or restored.

Claim 26 is separately rejected over Kambara in view of Bensimon and Miyachi in further view of Kaiser et al. While the Examiner accurately summarizes Kaiser's description

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of treating polymeric molecules with a condensing agent, the rejection must fall for the reasons noted above.

For all of these reasons, applicants maintain that the Examiner has not made a prima facie case of obviousness, but instead has improperly relied upon irrelevant structures and methods in an effort to find similarity and overlap where none exists. Reconsideration is respectfully requested.

A petition for an extension of time accompanies this response so the response will be deemed to have been timely filed. No other extension of time is believed due, but should such an extension be due in this or any subsequent response, please consider this to be a petition for the appropriate extension of time and a request to charge the extension fee to Deposit Account No. 17-0055. Likewise no other fee is believed due, but should any such fee be due in this or any subsequent response, please consider this to be a request to charge the fee to the same deposit account.

Respectfully submitted,

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